SCIENCE.—SUPPLEMENT.

FRIDAY, NOVEMBER 13, 1885.

THE RESULTS OF SHAD PROPAGATION ON THE ATLANTIC COAST.

AT a recent meeting of the Biological society of Washington, Col. Marshall McDonald read a paper upon the necessity of artificial propagation, in relation to the maintenance of the shad fisheries. He argued that the shad fisheries depend upon artificial production for their maintenance. This theory was illustrated by a comparison of statistics for 1880 and 1885, and a consideration of the attendant conditions. The figures for 1880 were taken from the census reports; those for 1885 from a recent reconnoissance by experts, usually the same persons who made the census reports. He brought together the statistics of all the rivers of the Atlantic slope. The catch in each river fluctuates under local conditions. It is not true that shad, spawned in certain rivers, necessarily return to the same rivers. They remain, it is true, in the geographical area in which they were spawned, but may seek any fresh water within that area. It is only by taking the statistics of the rivers of the entire area that it could be determined whether there had been an actual increase or decrease. Table I. giving "Comparative statistics of the shad fisheries of the Atlantic coast rivers," was submitted.

TABLE I.

COMPARATIVE STATISTICS OF THE SHAD FISHERIES OF THE ATLANTIC COAST RIVERS FROM CAPE COD, MASS., TO CAPE HENRY, VA., FOR 1880 AND 1885.

	Number of shad taken in 1880.	Number of shad taken in 1885.	Per cent of increase or decrease.	Remarks.
Connecticut River and tributaries	268,608	215,000	25% Decrease.	The aggregate increased catch of shad in 1885 over 1880 amounted to—
Hudson River	781,628	1,174,028	33% Increase.	In quantity.....1,050,000 lbs.
Delaware River and Bay	735,300	1,148,496	36% Increase.	In value.....$73,530.
Chesapeake Bay and its tributaries	2,084,600	1,632,600	21% Decrease.	
Aggregate catch	3,870,136	4,170,124	7.8% Increase.	

While the commercial value of the increase was not large compared with the whole, that sum was ten times as great as the yearly sum spent by the fish commission upon the work of propagation.

In order to arrive at a measure of the increase or decrease of the shad fisheries of the Atlantic coast rivers, it is necessary to compare the aggregate catch in the principal rivers. Conclusions

TABLE II.

COMPARATIVE STATISTICS OF THE SHAD FISHERIES OF CHESAPEAKE BAY AND ITS TRIBUTARIES FOR 1880 AND 1885.

	Number of shad taken in 1880.	Number of shad taken in 1885.		Total number of shad taken in 1885.	Per cent of increase or decrease.	Remarks.
		In salt water	In fresh water			
By pound net fisheries in Chesapeake Bay outside of the mouths of the rivers	593,248	713,448	.....	713,448	20% Increase.	67% of all shad taken in the Chesapeake and its tributaries in 1885 were taken in salt or brackish water before reaching spawning grounds. The 33% taken by the river fisheries on, or in the vicinity of, their spawning grounds, being captured for the most part before they had spawned, it will be seen that we are dependent for natural reproduction upon the small number of shad that escape the pound nets and elude the energetic pursuit of the river fishermen.
Susquehannah River and minor tributaries at the head of Chesapeake Bay	614,000	50,000	162,161	212,161	65% Decrease.	
Potomac River	582,800	60,000	97,697	157,697	74% Decrease.	
Rappahannock River	134,000	220,000	30,000	250,000	86% Increase.	
York River (all salt water) catch, included in the pound net fisheries of the bay	.....	.....	.....	.....	.....	
James River	106,000	45,000	200,000	245,000	131% Increase.	
Minor tributaries of the Chesapeake on eastern shore of Maryland and Virginia	54,500	27,250	27,250	54,500	.....	
Aggregate catch	2,084,548	1,115,698	517,108	1,632,806	21% Decrease.	

based upon the fluctuations of catch in a single river are necessarily fallacious, since such fluctuations are due to local causes. So far as the shad is concerned, all the rivers draining into the Atlantic between Cape Cod and the capes of the Chesapeake, and the submerged continental borders lying between the coast line and the Gulf Stream, constitute a single zoölogical province, within the limits of which the migrations of the shad are confined.

In February and March, when their migrations into continental waters begin, the direction of their movements is largely determined by temperature conditions existing in the area in which they are. The principal migration may be into the Chesapeake, or it may be up the coast into the Delaware, the Hudson, and the Connecticut; but in either case the aggregate catch will furnish a just measure of increase or decrease. A comparison of the statistics of the fisheries for 1880 and 1885 (see table I.) shows a gain of nearly eight per cent in the aggregate catch. The significance of this, as showing the value and necessity of artificial propagation, will be better appreciated by considering the adverse conditions under which it has been accomplished:—

1. Access to suitable spawning grounds in fresh water is a physiological necessity.

2. Access in sufficient numbers to compensate by natural reproduction, waste by casualty or capture, is necessary to prevent the eventual destruction of our shad fisheries if we rely upon natural reproduction solely.

3. Existing adverse conditions limit natural reproduction, so that we cannot depend upon it to keep up supply.

(*a*) Dams in our rivers have curtailed the spawning areas to less than half of what they formerly were.

(*b*) The spawning grounds still accessible have been destroyed by the pollution of the waters, which are thus rendered unfit to sustain the delicate embryo shad.

(*c*) The change in the location of the fishing grounds, and the increasing proportion of shad taken year by year outside of the mouths of the rivers, or in the rivers before they have reached spawning grounds, has so reduced natural reproduction as to render it an insignificant factor in keeping up supply.

Under such conditions, the spawning area being limited, and the shad excluded from fresh water, without artificial propagation, the shad must soon be exterminated, or there must at least be such reduction as to render the fisheries unprofitable. Such a crisis was fast approaching in 1879, when the fish commission began the work of shad propagation. The work of artificial propagation has not only held the balance even, but resulted in a slight increase.

Colonel McDonald deprecated the methods employed in shad fishing, especially the use of pound nets. In the Connecticut River, where pound nets are used, the greater part of the catch is taken in salt water. In the Hudson, since the laws of New York do not permit fishing with pound nets, the river is not obstructed to the same extent as the Connecticut. In the Delaware, where an increase is shown, there are no pound nets. In the Chesapeake and its tributaries, with a decrease of 21 per cent, 713,000 of the shad caught this year, or more than one-half of the whole catch, were caught in the salt water of the bay. The pound nets begin at the capes, and extend to the mouth of the Potomac. Prior to 1871 the shad were taken entirely in fresh water, but now over one-half are caught in salt water. In the Potomac River nearly one-half of the catch is made in water where the fish cannot spawn. In the Rappahannock one-half the catch is in brackish water. In the York River the catch is practically below Gloucester Point. In the James River there are no pound nets, and in that river is an increase in the catch. While the fisheries in the Chesapeake Bay and its tributaries, as a whole, have fallen off 21 per cent, the decrease in the catch in certain rivers is much greater. The catch in the Susquehanna in 1880 was 614,000, against 212,000 in 1885; and in the Potomac, 552,857 in 1880, against 157,697 in 1885. The reason of this is obvious. In 1871 there were no pound nets in Chesapeake Bay, and no shad were taken until they entered fresh water. Gilling was not prosecuted so low down the river as now. In 1880 there were in Chesapeake Bay 180 pound nets set in the track followed by the shad along the western shore, and through these the shad had to run a gauntlet up to the mouths of the rivers. Now there are 1,000 pound nets, occupying the western shores of the bay, and excluding the fish from the fresh water. The effect of the salt-water fishery is to diminish natural reproduction, and to invoke artificial propagation as a necessary aid to the fisheries. If all shad were excluded from our rivers for three or four years, without artificial propagation, the species would be exterminated. Taking all the facts into consideration, and the inadequacy of natural reproduction to supply the annual loss, we must credit artificial reproduction not only with having maintained the fisheries where they were, but with an increase which repays ten times the cost of the work of shad propagation, as carried on by the U. S. fish commission and those of the several states.

INFANT PSYCHOLOGY.

THE modern psychologist must be a very busy man. We may suppose him to be a college professor, introducing his students into the principles of his science. Besides this, he is the director of a psychophysical laboratory, where he subjects himself and others to tortuous and tedious experiments, almost deserving the name of vivisection. Moreover, he must be intimate with the asylums for the insane and the idiotic, in order to study the mind in its morbid conditions; he must be at home in institutes for the blind and for deaf-mutes, in order to appreciate the *rôle* played by each sense in the sensual and intellectual life; he must talk to the inmates of prisons and poor-houses in order to understand the condition of those in whom the instinct of morality and the power of the will are at a low ebb; he must be active in psychic research and be ready to investigate the claims to unusual mental faculties; and now for what remains of his time, he is called into the nursery.

'Infant psychology' (by which name we must now know this field of study) has for its aim, the tracing of the mental development,—the psychical evolution,—of the infant from birth upward. The literature of the science is as yet small; every single contribution, however, has been made by able hands; and the work of M. Perez[1] is a good type of this new tendency in modern psychology. In his former educational works as well as in his ingenious study of his 'two cats' (Mes deux chats), M. Perez has proved himself possessed of an unusual psychological acumen. We probably owe the appearance of this book in an English dress to Mr. James Sully, who prefaces it with an appropriate introduction; great credit is due to the translator (Alice M. Christie) for her careful and easy rendition.

It would be impossible here to do more than indicate the general lines of interest pursued in the book, and sample its method and wealth of facts.

We may trace as many as five distinct interests which such study furthers: —

1. It interests the pyschologist, as an important chapter in the study of mind, its psychogenesis.

2. It interests the anthropologist, to whom the remarkable analogy between the mental world of the child and that of primitive savages, is rich in suggestiveness. Impulsiveness and irascibility, to give one of a host of examples, are seen almost in the same aspect in savages and children. 3. It interests the alienist who finds, in the degeneration of mental tissue as shown in his insane patients, the same mental peculiarities, but occurring in a reverse order, as in the process of brain building in the child. The earliest memories are the last to fade away: the old man becomes childish. 4. It interests the student of comparative psychology, who notes the strong resemblances between the reasonings of the child and those of the higher animals. They fall into the same kind of errors and exhibit the same kind of peculiar tendencies; witness how often a child is called a 'monkey,' or a 'pussy.' 5. Lastly it interests the educator. The human child spends its first years in a condition of helplessness such as is seen in no other animal. It needs more watchfulness, more care, more education. To give this education, in a rational way, requires the study of the infant's mind, "for the cardinal principle of modern educational theory is, that systematic training should watch the spontaneous movement of the child's mind and adapt its processes to these" (Sully).—All of these will find that none of their points of view has been neglected in this book.

The scope of the work is wide: it covers really everything that can be called psychic in the first three years of life. Indeed the first chapter treats of the 'Faculties of the infant before birth.' From its first cry on entering this world (which Schopenhauer takes as a pessimistic omen), his first movements, sensations, emotions, expression of will power, all are recorded and from them his mental status deduced. Systematic experiments are arranged and spontaneous movements and expressions noticed as well. The last chapters are devoted to the reasoning powers of children, their language, their logic, their æsthetics, their ethics, and, a very interesting point, their dramatic instinct.

Take the sense of taste for example. It is in the sphere of this sense that the child's first pleasure is felt, a few hours after birth, in the appeasing of hunger. At an early period disgust through taste is possible. A child 2½ months old refused its bottle with determination and a face of disgust, because it was not sweetened with sugar. Illusions of taste appear early. The taste of children changes easily, which is a reason for not forcing them to eat things against their inclination. Its most vivid sentiments are for a long time connected with this sense. "Their first affections are those of an epicure; their first feelings of gratitude are awakened by the stomach; they test their first tactile experiences as much as possible by the sense of taste." Everything goes to the mouth. "*Pretty to look at*, and *good to eat*, are synonymous terms to babies." We can see how largely their earliest mental horizon is dominated by the feeling of hunger and the sense of taste.

The emotional life of the child begins early. Fear is one of its first emotions. Darwin has

[1] *The first three years of childhood.* By BERNARD PEREZ. Translated by Alice M. Christie, with an introduction by James Sully. London, *Sonnenschein*, 1885. 294 p.

noticed signs of fear at an unexpected noise or strange face in the first weeks. Between the 3d and the 10th months, fright is caused more often by auditory than by visual impressions. A child of 3½ months showed no sign of fear at a conflagration, though surrounded by flames, until the noise of the fire engine was heard, and then he trembled and cried. Thunder terrifies rather than lightning. This is referred to as hereditary and the result of anterior experiences, which have "rather predisposed the race to listen for dangers which are near at hand, than to be on the lookout for distant ones." The reverse is true of most animals.

Finally as an example of the logical powers of infants, that of generalization will serve. Dogs generalize; they bark at all beggars; yet they distinguish one beggar from another on nearer approach. A child had a tin box into which he used to delight to stuff things; he soon found that other of his toys had the power of holding things; then he tried to find an opening in everything, into a glass stopper because it was transparent; in short, he had acquired a general idea of an opening. Another child had a canary named 'Koko'; when he saw chickens in the yard or ducks in the pond, they were 'Koko' too. While these young children generalize before the acquisition of language, they do not compare. A child was shown a print and stretched out her hands for it; then a colored print was shown; her joy was beyond bounds. In a second experiment both were shown at once; she took them for one picture and threw herself towards both; her attention was not directed to the brighter one. These illustrations are doubtless sufficient to indicate the character of the volume.

The record of one or two infants is naturally unsatisfactory; individual peculiarities are certain to enter. What is wanted is a collation and average of many observations. For England, Darwin and Pollock, for France, Taine and Perez, for Germany, Tiedemann, for Austria, Preyer, for Italy, Ferri, have contributed to this study. May we not soon expect to hear as to the psychology of the American baby?

J. Jastrow.

LEGAL OHM STANDARDS.

After the decision of the Paris electrical congress of 1884, that the standard resistance, or legal ohm, should be the resistance of a column of mercury of one square millimetre cross-section, and 106 cms. in length, at zero centigrade, it became necessary to construct standards that should represent this resistance. In France this task was intrusted by the minister of posts and telegraphs to M. J. R. Benoît; and in England Mr. R. T. Glazebrook, at the request of the electrical standards committee of the British association, undertook the same work.

M. Benoît attacked the question *ab initio*. From a large number of glass tubes, of about 120 cms. length, and 1 mm. diameter of bore, the four that had the most uniform bores were selected. These tubes were laboriously calibrated to determine the cross-section at every point, and each was then cut off so that the resistance of the column of mercury filling the tube should be as nearly as possible the same as that of the column defined as the standard. The points where the tubes were cut off were determined from the calibration. The resistance of each tube was then calculated from its dimensions, with the following results:—

Tube 1 = 0.999999 legal ohms.
2 = 1.000004 ,, ,,
3 = 0.999979 ,, ,,
4 = 0.999994 ,, ,,

The tubes were then cleaned by passing through them successively strong nitric acid, ammonia, and distilled water; then filled with pure mercury, and their resistances compared by balancing them against each other in a Wheatstone's bridge. This comparison showed, that, if the mean of the calculated resistances be the mean of the true resistances, the resistances of the several tubes are as follows:—

Tube 1 = 1.000018 legal ohms.
2 = 0.999996 ,, ,,
3 = 0.999959 ,, ,,
4 = 1.000003 ,, ,,

Accepting these as the true resistances, M. Benoît made a number of secondary standards, of glass tubes doubled upon themselves and bent into compact forms, and with cups at each end for making contact. The resistances of these tubes, when cleaned and filled to certain marks on the cups with pure mercury, were determined by comparison with the primary standards mentioned above.

Mr. Glazebrook considered it unnecessary, for the construction of the required standards, to go through the laborious process adopted by M. Benoît, for the specific resistance of mercury had been determined in terms of the British association standards, in several elaborate investigations by Lord Rayleigh, Mascart, Strecker, and others, and so based his standards on the value of the resistance of mercury adopted by the British association committee; viz., a column of mercury at zero centigrade, one metre long, and one square mm. cross-section, has a resistance of .9540 B. A. units.

Mr. Glazebrook has made a careful comparison of his legal ohm standards with those made by Benoît, and finds that there is a difference of .0005 ohms between them, the Benoît standards being less by that amount.

Two of these Benoît standards gave different results at different times. For instance, one whose resistance had been designated as 1.00045 legal ohms by Benoît, showed, when first filled, the same resistance in terms of the Cambridge standards; the next day its resistance was found to be 1.00071, and, on flowing the mercury back and forth through it, it rose to 1.00080. The tube was examined, but no trace of an air bubble was seen. It was then cleaned and filled again, and afterwards gave consistent results, the mean being .99990 legal ohms, though the same precautions were taken in the first filling as in the last. This result indicates the uncertainty of mercury standards, and the extreme care that is required to obtain consistent results. Every mercury standard should be made of such a form that the tube can not only be washed, but wiped out by some mechanical means. It is important to notice that the rate at which the resistance of mercury varies with the temperature has been examined lately by Mr. Glazebrook, and he finds that the rate of change diminishes rapidly as we approach 0°; the average change between 0° and 5° being .000884, while between 0° and 15° it is .000879.

CHOLERA PROSPECTS FOR ENGLAND.

IN regard to the prospect of the cholera reaching England this season, the *Lancet* of Oct. 24 says: We have now reached a period when we may fairly form a judgment as to the more immediate cholera prospects for England. Although cholera in Europe usually follows certain definite rules as to climate and season, yet it deviates from these sufficiently often to impart an element of uncertainty to any opinion concerning its movements. But notwithstanding this, the chances of any extension of the present epidemic to this country are now so remote that we may fairly conclude that we have for a third year escaped from the danger with which we have been threatened. It is true that in 1884 our greatest danger did not arrive until Paris had become infected, and that this did not take place until we were well into the first week of November; but, on the other hand, the extent and the area of diffusion of cholera in France was last year far greater than it has been this year, and cholera deaths occurred in 1884, both at Toulon and Marseilles, until about the end of November. This year, on the contrary, France has practically been free from cholera for some time, and the main risk we have to contend with lies in our shipping relations with Spain and Sicily, and these are limited both in amount and in the number of home ports concerned. So, also, we have had evidence that the vigilance and activity which have been exercised by our port authorities with regard to any such importations have been successful, even when, in a few occasional instances, there was reason to believe that isolated cases of the disease had found their way to our shores. And, further, the danger from places in the south of Europe, which are still infected, is every week becoming less by reason of a general subsidence of the epidemic. On the whole, therefore, we may with a considerable degree of confidence conclude that we have another season before us during which we may, unhindered by any element of panic, go on maturing our preparations to withstand such danger of cholera importation as may recur next year; and we have the satisfaction of knowing that the preparations needed are precisely those which will tend to diminish mortality from other causes than cholera, and that the needed expenditure will in the end tend to our prosperity.

ARTIFICIAL PROPAGATION AND CULTIVATION OF OYSTERS IN FLOATS.[1]

WITHOUT expressing any opinion as to the value of the process of 'fattening' oysters by placing them for a few days in cars floating in fresh water, I wish to point out that there is no similarity between this process and the process of propagation which is here described.

My attention was first called to the value of floating cars in oyster culture by Mr. William Armstrong of Hampton, Virginia, who informed me in 1884 that 'seed' oysters, which he had placed in floating cars in the mouth of Hampton Creek, grew more rapidly, and were of a better shape and more marketable, than those which grew from seed planted on the bottom in the usual way.

One of the results of my study in 1879, of the development of the oyster, was the discovery that there is a period of several hours, immediately after the embryo acquires its locomotor cilia, when it swims at the surface, and this is the period when it is swept into contact with collectors. As soon as the shell appears, the larva is dragged down by its weight, and either settles to the bottom and dies, or swims for a time near the bottom. The tendency to swim at the surface is an adaptation for securing wide distribution by means of the winds and currents which sweep the young oysters against solid bodies which may serve for attachment; and the greatest danger to which the oyster is exposed, at any part of its life, is that it may not, at the swimming stage, find a clean, hard surface for attachment.

[1] From *Johns Hopkins university circulars*, October.

As it is microscopic and only about half as thick as a sheet of thin paper, it may be smothered by a deposit of sediment or mud so light as to be invisible; and most of the failures to get a good 'set of spat' are due to the formation of a coat of sediment upon the collectors before the young oysters come into contact with them.

It occurred to me this summer that this danger could be entirely avoided by the use of floating collectors; for little sediment can fall on a body which is close to the surface of the water, and most of this will be swept away by currents, which will, at the same time, sweep the swimming embryos down into the collector, and thus insure an early, abundant, and successful 'set.'

I accordingly constructed a floating car, made so as to permit the free circulation of the water. This was filled with clean oyster-shells, and moored in the channel in front of the laboratory at Beaufort, N. C., on July 4. As all the oysters in the vicinity were in very shallow water, they were nearly through spawning, and the conditions were therefore very unfavorable; but, notwithstanding this, I immediately secured a good 'set,' and the young oysters grew with remarkable rapidity, on account of the abundant supply of food and fresh water which gained ready access to all of them, and the uniform temperature which was secured by the constant change of water.

This method of oyster culture may be applied in many ways, of which the most obvious is the production of seed oysters for planting.

The 'seed' which is used for planting in Maryland and Virginia, as well as in Delaware and farther north, is now procured from the natural beds of our waters by tonging or dredging, and as the demand for oysters for this purpose is certainly one of the elements which have led to the depletion of our beds, there is a wide-spread feeling that the exportation of 'seed' should be prohibited.

By a small investment of capital in floating collectors, any one on tide-water could easily raise large quantities of much better, cleaner seed than that which is now procured from the natural beds; and, if the laws permitted the sale and transportation of this seed without restriction at the season when the demand exists, it could be sold at a profit for less than the cost of tonging.

Northern planters could also raise seed for themselves by constructing floating collectors in the warm water of the sounds of Virginia and North Carolina, where the length of the summer would permit several collections to be made in one season. The oysters thus reared are large enough for planting in five or six weeks, and in the latitude of Beaufort there is an abundance of spat from the middle of April to the first of July, and it can be collected until September.

The method may also be used by planters for collecting their own seed, especially in regions remote from a natural supply. If there are no oysters near to furnish the eggs, a few spawning oysters may be placed among the shells in the collector, after the French method, to supply the 'set.'

It can also be used for the direct production of marketable oysters, especially over muddy bottoms, and in regions where public sentiment does not permit any private ownership of the bottom.

As food for the oyster is most abundant at the mouths of muddy creeks, where the bottom is too soft for oyster culture by planting or by shelling, this method will have especial advantage in such places; for there will be no danger of sanding or of smothering by mud at the surface, and there is no limit to the number of oysters which can thus be grown on a given area, for the free current of water will bring food to all of them.

The very rapid growth will more than compensate for the cost of the floats, and Mr. Armstrong's experiment shows that, in addition to all these advantages, the oysters are of a better shape, with better shells, and more marketable, than those grown at the same place on the bottom.

Finally, this method will do away with the necessity for a title to the bottom, and will thus enable a few enterprising men to set the example of oyster culture, and, by the education of the community, to hasten the time when wiser laws will render our natural advantages available for the benefit of our people.

The most economical method of constructing floats must, of course, be determined by practical experiments; but a float constructed by connecting two old ship-masts together by string pieces, with a bottom of coarse galvanized iron netting, would have sufficient buoyancy, and enough resistance to water, to support a large quantity of submerged shells and oysters for two or more seasons, and a coating of copper paint each year would protect the timbers from worms.

The floats should be open at the ends to permit free circulation, and they should be moored in such a way as to swing with the current.

Engagement in business projects is no part of the office of a university, and I feel that the experiments of the past summer have brought the subject of oyster culture to a point where its further development should be left to the people who are most interested.

W. K. Brooks.

ANTI-CHOLERA INOCULATION.

DURING the past summer the public has been made aware, through the medium of the newspapers, that a certain Dr. Jamie Ferran, hitherto unknown to fame, professes to have discovered a safe and certain method of securing immunity against Asiatic cholera by a process analogous to vaccination.

As most people know, the researches of Pasteur, Koch, and others, have, within the last few years, made it seem extremely probable that the whole class of contagious or zymotic diseases is the direct result of the growth in the body, and particularly in the blood, of certain exceedingly minute micro-organisms called bacteria. Each of these diseases is supposed to be caused by its own peculiar species of bacterium, and the course of the disease is understood to end when the supply of the peculiar element necessary to the growth of these bacteria is exhausted. If this element is one that cannot be reproduced, the disease cannot recur; and if by any means we can remove this element, and keep it removed, we can prevent the attack of the disease. This is what has been done in case of small-pox, and this is what Dr. Ferran claims to have done in case of cholera.

In considering the truth or falsity of this claim, three questions arise: First, Is cholera caused by the growth of micro-organisms in the body, and, if so, is it possible that the element necessary to their existence can be removed? Second, By what means does Dr. Ferran claim to have removed this element? Third, What has been his success?

From the researches of Koch and others, it does seem probable that Asiatic cholera is caused by the growth of the comma bacillus in the intestinal tract and in other parts of the body; for it has been shown that this bacillus is always present when cholera is present; that it is never found in the body unless cholera is present; and that in all probability its injection into the intestine would cause the appearance of cholera.[1] But there seems to be little reason to suppose that the element of the body which constitutes the proper food of the comma bacillus can be, at least permanently, removed; for one attack of cholera affords no immunity against a second. In justice to Dr. Ferran, however, it should be said that he only claims that his system affords temporary protection.

The means by which this protection is said to be secured are as follows: By methods only known to the discoverer, the comma bacillus is so cultivated that its spores are produced. From these spores, which are capable of enduring conditions that would prove fatal to the bacilli themselves, mulberry-like masses form, and these masses, in turn, give birth to a generation of true bacteria.[1] By introducing into the circulation a small quantity of liquid containing these spores, mulberry-like masses, bacilli, etc., it is said that those elements on which the comma bacillus feeds can be removed from the blood without much constitutional disturbance, thus securing immunity against an attack of cholera until these elements can be renewed.

But, to say nothing of the suspicious secrecy with which all this process is surrounded, it seems certain, from the reports of those who have sought to investigate or repeat Dr. Ferran's experiments, that he is entirely ignorant, or at least careless, of the nice technical details necessary to success in the study of bacteria, and that his so-called spores are sterile and disorganized products,[2] and therefore incapable of exerting any salutary effect as an anti-cholera inoculation.

The results obtained by Dr. Ferran in his experiments are more difficult to criticise than either of the preceding questions; for almost all that is known about these results is what he has chosen to tell, and his personal equation, so to speak, is an unknown quantity, unless it can be inferred from the character of a man who acknowledges himself willing to keep secret a certain means of securing safety from the attacks of a disease like Asiatic cholera, for the simple reason that he has not yet secured a suitable pecuniary reward.

His method of procedure seems to be about as follows: From twenty to fifty francs are first collected from the person who is to be inoculated. Then about one-half a cubic centimetre of the inoculating fluid is injected deeply into the outer and back part of the upper arm by means of a common hypodermic syringe. The results of this injection are, according to Dr. Ferran, local pain and swelling and slight constitutional disturbances, — fever, diarrhœa, etc., — all passing off in from twelve to twenty-four hours. This is followed by a re-inoculation at the end of about eight days, the same quantity of virus being injected subcutaneously. The patient thus treated is said to be safe from an attack of cholera for a considerable length of time.

Some of those who have visited Spain during the past year to investigate these experiments confirm these statements;[3] others say[4] that deep

[1] It seems probable that, in Dr. Klein's experiments to show the harmless nature of the comma bacillus, his methods of cultivation had rendered the organisms innocuous.

[1] *Zeitschr. klinisch. med.*, ix. 361–373.

[2] Virchow, *Deutsch. med. wochenschr.*, xi. 342.

[3] Van Ermingem, *Deutsch. med. wochenschr.*, xi. 498.

[4] *Brit. med. journ.*, June 9, 1885.

ulcerations, septicaemia, pyaemia, etc., are caused by these inoculations. But as these dire results are mentioned by only one writer, and are explicitly denied by other unprejudiced witnesses, they seem hardly worthy of credence. It furthermore seems certain that no one has contracted cholera by being inoculated according to Ferran's method.

When we come to consider the statistics as returned by the French and German officials who have been sent to Spain to investigate Dr. Ferran's experiments, we find numerous obstacles in the way of arriving at a satisfactory conclusion. In the first place, there is no accurate census report on which to base the calculations; in the second place, the number of inoculations actually performed is not exactly known by any one except Dr. Ferran, and it is chiefly from him that our information comes as to the relative number of deaths and inoculations; and, in the third place, the total number of deaths is not known with any certainty. Yet the figures are of some interest, as showing what those who have had the best opportunity to investigate the matter think of the efficacy of anti-cholera inoculation as practised in the villages of Alcira (*a*), Alberique (*b*), and Algemesi (*c*). They read as follows:[1] —

	Official population.	Probable population.	Non-inoculated.				Inoculated.			Re-inoculated.		
			Minim'm.	Maxim'm	Attacks.	Deaths.	Number.	Attacks.	Deaths.	Number.	Attacks.	Deaths.
a	16000	23000	3500	13500	374	169	10500	37	7	3011	35	6
b	5000	.....	4000	.....	192	173	988	10	2	....	3	..
c	7856	10500	6600	9300	484	208	1202	21	5	633	1	1

It was in these three towns that Dr. Ferran carried on his experiments most extensively, and, if it could be proved that these statistics were accurate, a very strong point would certainly be made in favor of anti-cholera inoculation; for it would be almost inconceivable that chance should give results very far from the truth, where so large a number of individual cases are concerned. But when we consider the *a priori* improbability that a disease which by its first attack confers no immunity against a second attack can be guarded against by any form of inoculation, and when we consider the alleged nature of the process by which this wonderful result is said to have been reached, and the character of the man who says he has reached this result, the inference seems very clear that there is something wrong with the statistics: in other words, it seems more reasonable to suppose that Messrs. Brouardel, Charrin, Albarran, and others have been mistaken or deceived in regard to the facts, than that anti-cholera vaccination as practised by Dr. Ferran is a success.

F. S. Bunker.

[1] *Bulletin acad. med.*, xiv. 902-913.

THOMAS BLAND.

This well-known naturalist, after an illness of some two years' duration, died August 20, 1885, in Brooklyn, N.Y.

He was born in Newark, Nottinghamshire, England, October 4, 1809. His father was a physician, and his mother related to Shepard, the naturalist. He was educated at the Charter house school, London, and had Thackeray for a classmate. Subsequently he studied and practised law. He went to Barbadoes, West Indies, in 1842, and later to Jamaica; visited England in 1850, and in the same year accepted the superintendency of a gold mine at Marmato, New Grenada. While a resident of Jamaica it was visited in 1849 by Prof. C. B. Adams of Amherst, and, stimulated by his friendship and enthusiasm, Bland began those investigations of the land-shells for which he afterward became so distinguished. In 1852 he came to New York, which, for most of his subsequent life, became his home. Mr. Bland was of a studious and rather grave demeanor, but notably courteous, and always ready to assist young students or others interested in his favorite pursuit. In spite of his extreme modesty, Mr. Bland was several times called to posts of honor and responsibility. By those privileged to know him, he was held in high esteem, which was not lessened by his bearing under tribulation and poverty during his later years.

Mr. Bland was the author of more than seventy papers treating of the Mollusca, especially of the United States and the Antillean region. His work was not confined to description of species, but comprised valuable contributions to their anatomy, classification, geographical distribution, and the philosophy of their development. No American student has shown a more philosophic grasp of the subject; and his discussion of the geographical distribution of the land-shells of the West Indies, published in 1861, gave him a wide reputation. He several times returned to this subject in later years, and always with marked success. Since 1869 Mr. Bland was associated with Mr. W. G. Binney in several important works, especially the 'Land and fresh-water shells of North America,' issued by the Smithsonian institution. Mr. Bland was a fellow of the Geological society, and an active member for many years of the New York lyceum of natural history. A convenient bibliography of his papers and contributions to malacology was prepared by Mr. Arthur F. Gray in 1884.